REMARKS

Claims 1-27 are pending in the application. In the Office Action at hand, those claims are rejected.

In particular, Claims 1, 2, 4, 8-10, 12, 14, 15, 17, 20-22, 24, 26, and 27 are rejected under §102(b) as being anticipated by Patrick in light of Potapenko. In addition, Claims 3, 11, 16, and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Patrick in light of Potapenko and Lee. Also, Claims 5, 13, 18, and 25 are rejected under Section 103(a) as being unpatentable over Patrick in light of Potapenko and Jones. Furthermore, Claims 6 and 19 are rejected under Section 103(a) as being unpatentable over Patrick in light of Potapenko and Aoki. Finally, Claim 7 is rejected under Section 103(a) as being unpatentable over Patrick in light of Potapenko, Aoki, and Goswami. In response to the Section 102(b) and 103(a) rejections, the Applicant respectfully submits that Claims 1-27, as amended, are neither anticipated nor obvious in view of Patrick, Potapenko, Lee, Jones, Aoki, and Goswami. Reconsideration is respectfully requested.

Claim 1, as amended, recites a method of forming a system for sterilizing air, including a duct for flowing the air therethrough. The duct has a width. A first electron beam generator can be positioned relative to the duct for irradiating the air flowing therethrough with a first electron beam. The first electron beam is for disabling microorganisms within the air. The duct and the first electron beam generator are sized to provide complete electron beam coverage across the width of the duct.

Claim 9, as amended, recites a method of forming an air circulation system, Claim 14, as amended, recites a method of sterilizing air, and Claim 21, as amended, recites a method of sterilizing air in an air circulation system. Claims 1, 9, 14, and 21 have been amended to recite "the duct having a width," and "the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct." In addition, Claim 26, as amended, recites a method of sterilizing air, and has been amended to recite "the duct having a cross section," and "the duct and the first and second electron beam generators being sized to provide complete electron beam coverage across the cross section of the duct." Support for these amendments is found at least in FIGs. 1, 4, and 12, as well as on page 5, line 8 through page 7,

line 15, and page 11, lines 7-27 of the Specification as originally filed. No new matter is introduced.

In embodiments of the claimed invention, the electron beam generator and the duct can be sized to provide complete electron beam coverage over the width of the duct, or the cross section of the duct (width and height), for example, as shown in FIGs. 1 and 4. In addition, a multiple emitter electron beam generator can be employed for larger ducts, as shown in FIG. 12. Virtually all the air that flows through the width of the duct can pass through the electron beam and be irradiated, thereby disabling microorganisms within the flowing air. The electron beam can disable or kill airborne microorganisms flowing in the air by damaging the DNA and/or structural matter, thereby sterilizing the air. Disablement of microorganisms by electron beam can be much faster and thorough than prior methods, such as by ozone or UV light which typically requires longer exposure to be effective.

In addition, Claim 27 recites a method of sterilizing air including directing an electron beam into a sterilization chamber. The air is directed into the sterilization chamber generally against the direction of the electron beam and then redirected generally along the direction of the electron beam for irradiating the air and disabling microorganisms in the air.

In one embodiment of Claim 27, referring to FIGs. 13-15, air can be irradiated in both forward and backward flow directions with increasing and decreasing electron beam irradiating intensity which combine to result in relatively uniform irradiation. This can provide an increased irradiation exposure time for the flowing air in comparison to the embodiment depicted in FIGs. 1 and 4, and can be suitable for use with a small or low power electron beam generator.

In contrast, Patrick discloses a treatment apparatus including a duct 12 having opposed electron beam guns 22 mounted to the duct 12. As can be seen in FIGs. 5 and 6, the windows 11 of the electron beam guns 22 extend only across the middle half of the duct 12, and as a result, the other 50% of the width of the duct 12 does not experience electron beam coverage (See FIG. 6). To compensate for the partial electron beam coverage, the interior of the duct 12 includes drag elements 23 and spaced apart bars 24 which direct the majority of flow toward the center of the duct 12 in line with the electron beam window 11. Since the bars 24 are spaced apart, a percentage of the flow will likely pass through the spaces between the bars 24 and get past the electron beam window 11 in regions that do not have electron beam coverage (50% of the duct's

width), thereby escaping irradiation. A percentage of untreated flow may be acceptable for treating exhaust gases from industrial plants, but it can be problematic when sterilizing air.

Potapenko discloses an apparatus for sterilizing air including an elongate ultraviolet (UV) light tube 24 having a cylindrical chamber 21 positioned concentrically about the UV light tube 24 which receives air from a rectangular duct 12. The cylindrical chamber 21 has a greatly reduced flow path spirally around the UV tube 24 for increasing the exposure time of the air passing by the UV light tube 24. Potapenko does not employ an electron beam generator arrangement.

Accordingly, Claims 1, 2, 4, 8-10, 12, 14, 15, 17, 20-22, 24, 26 and 27, as amended, are not anticipated by Patrick in light of Potapenko, since neither reference, alone or in combination, teaches or suggests "positioning a first electron beam generator relative to the duct for irradiating the air flowing therethrough with a first electron beam, the first electron beam for disabling microorganisms within the air, the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct," as recited in independent Claim 1, as amended, and similarly in independent Claims 9, 14, and 21, as amended, or "irradiating the air flowing through the duct with opposed first and second electron beams from first and second electron beam generators for disabling microorganisms in the air, the first and second electron beam generators being positioned relative to the duct opposite from each other, the duct and the first and second electron beam generators being sized to provide complete electron beam coverage across the cross section of the duct," as recited in independent Claim 26, as amended, or "directing the air into the sterilization chamber generally against the direction of the electron beam and redirecting the air generally along the direction of the electron beam for irradiating the air and disabling microorganisms in the air," as recited in independent Claim 27. Therefore, Claims 1, 2, 4, 8-10, 12, 14, 15, 17, 20-22, 24, 26, and 27, as amended, are in condition for allowance. Reconsideration is respectfully requested.

Lee discloses an apparatus for removing harmful gases, for example NO_x, SO_x and HC. The gases are treated by reaction units 100 (FIG. 1). In a reaction unit 100, electricity travels from the electrodes 111 of discharge cells 110 (FIG. 3) radially inwardly to the outer cylindrical surfaces of a cylindrical electron beam pole 120 (FIG. 2), thereby forming an annular reaction region of electricity and laser beams. The electrodes 111 and electron beam pole 120 form a

capacitor as shown in FIG. 18 (Col. 11, lines 64-67). Column 12, lines 21-37 discloses that the apparatus can be used as a sterilizer due to the ozone generating function. Consequently, Lee teaches sterilization by ozone, and does not teach or suggest sterilization by irradiation with electrons.

Detzer discloses a conditioner for air having an air conditioner 1, a fan 2, and a duct 17 through which air flows from the air conditioner 1. An oxidizing unit 3 on the duct 17 receives ozone from an ozonator 5 for oxidizing pollutants flowing in the air, typically VOCs. Column 2, lines 66-68 disclose that bacteria living on wet condenser coils can be eliminated. The ozone can then be removed with a filter 6. Detzer does not have an electron beam generator.

Accordingly, Claims 3, 11, 16, and 23 are not obvious in view of Patrick, Potapenko, Lee and Detzer since none of the references, alone or in combination, teach or suggest "positioning a first electron beam generator relative to the duct for irradiating the air flowing therethrough with a first electron beam, the first electron beam for disabling microorganisms within the air, the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct," as recited in independent Claim 1, as amended, and similarly in independent Claims 9, 14, and 21, as amended. Therefore, Claims 3, 11, 16 and 23 are in condition for allowance. Reconsideration is respectfully requested.

Jones discloses an air purification system which employs a UV lamp 80 positioned within a section 60 having polished light reflective surface. Jones does not teach or suggest sterilizing with an electron beam, or a reflector for reflecting electron beams.

Accordingly, Claims 5, 13, 18, and 25 are not obvious in view of Patrick, Potapenko, and Jones, since none of the references, alone or in combination, teach or suggest "positioning a first electron beam generator relative to the duct for irradiating the air flowing therethrough with a first electron beam, the first electron beam for disabling microorganisms within the air, the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct," as recited in independent Claim 1, as amended, and similarly in independent Claims 9, 14, and 21, as amended. Therefore, Claims 5, 13, 18, and 25 are in condition for allowance. Reconsideration is respectfully requested.

Aoki discloses treating waste gases having SO_x and NO_x with electron beams. Aoki does not teach or suggest sterilizing air.

Accordingly, Claims 6 and 19 are not obvious in view of Patrick, Potapenko, and Aoki, since none of the references, alone or in combination, teach or suggest "positioning a first electron beam generator relative to the duct for irradiating the air flowing therethrough with a first electron beam, the first electron beam for disabling microorganisms within the air, the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct," as recited in independent Claim 1, as amended, and similarly in independent Claim 14, as amended. Therefore, Claims 6 and 19 are in condition for allowance. Reconsideration is respectfully requested.

Goswami discloses photocatalytic air disinfection and employs a bank of UV lamps 24 within a reactor 21. Goswami does not employ an electron beam generator.

Accordingly Claim 7 is not obvious in view of Patrick, Potapenko, and Goswami, since none of the references, alone or in combination, teach or suggest "positioning a first electron beam generator relative to the duct for irradiating the air flowing therethrough with a first electron beam, the first electron beam for disabling microorganisms within the air, the duct and the first electron beam generator being sized to provide complete electron beam coverage across the width of the duct," as recited in independent Claim 1, as amended. Therefore, Claim 7 is in condition for allowance. Reconsideration is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If

the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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